



RESILIENCE

Kansas State University

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From the beginning, a major issue for this home is that it needs to cater to residents in the income ranges defined by the client, who are looking to make St. John their home. As introduced earlier, these households would be at 80% of the median income in the county or below, which would include working families, professionals, and retired. However, we also have to design a solution for long-term residency. It can't just be a starter home for a narrow type of user. We agreed that this home needed to welcome all.

The Studio found that over 80% of St John's housing stock is more than 60 years old. Many older homes were never insulated or had their coal heating systems replaced, and over time these homes deteriorate as owners defer maintenance and eventually move away or die, leaving the homes to be demolished.



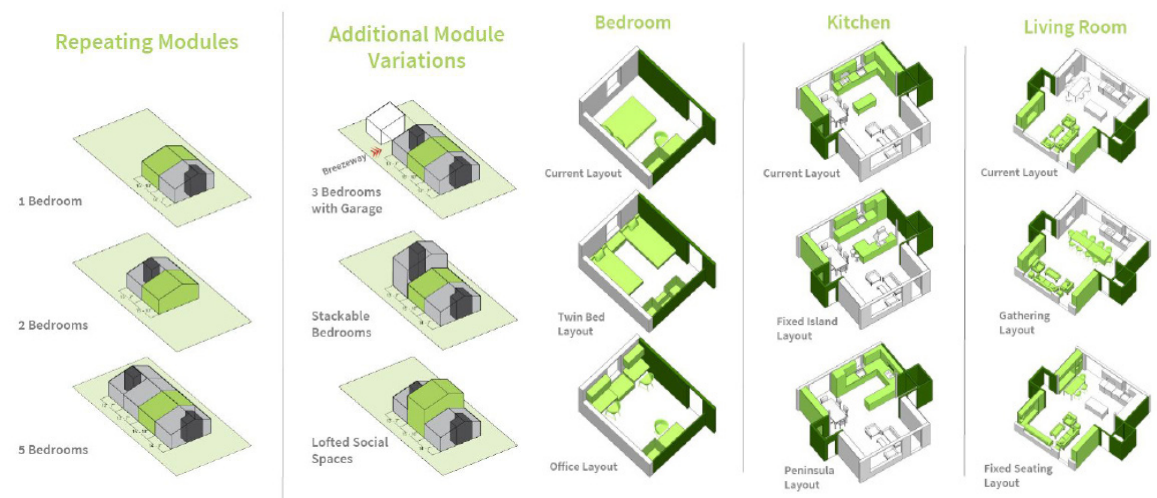
Dilapidated Home Located in St. John, KS.

The St. John prototype home demonstrates an alternative to conventional housing by leveraging the possibilities of design first: by designing a home that is much smaller than the average American home, but giving it the feel and the amenities of a bigger, more premium home. Through this goal, we can help make the home affordable by designing it efficiently the first time. Cost-saving systems like photovoltaic panels or high efficiency systems seem like an expensive add-on, but for a home that is already right-sized and efficient, these improvements can be afforded for all to utilize. Designing the home around the studio's Net Positive philosophy allows the resident to enjoy the benefits of a more expensive 'green home' at a lower cost, while opening up room in their budget for other things. We believe most residents can live within a smaller area if their home is functional and provides adequate storage, leaving possibilities to expand the home or add things like carports in the future. By selecting affordable and low maintenance materials and systems from the outset, the residents have less to worry about in the future. It's no longer enough to design a beautiful building; we need to provide the user with a sustainable, attractive home that they can also afford.

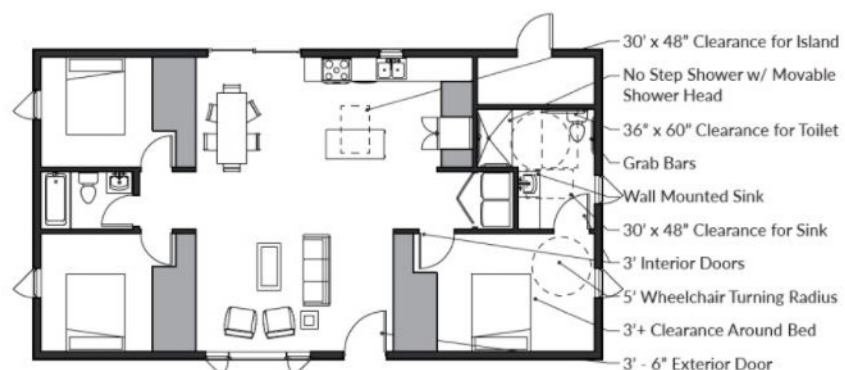
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Homes must be resilient; this was true even before COVID-19 tested the resilience of buildings of all types. Homes must be able to respond to the demands and needs of homeowners as they change over time, and resilience in small towns is even more important because housing options are inherently limited. Homeowners often can't move to a different house easily; your home has to be adapted, renewed, or somehow sustained.

The home in St. John was designed around a program that could serve a family through a wide range of conditions. With three bedrooms, it can accommodate households with children, yet the home is small and affordable enough to maintain for single homeowners, couples, retirees, or multigenerational households. The entry of the home was designed to be accessible according to universal design principles, with a level transition and a 36 inch doorway, and the doors throughout the house are configured to permit universal access. The structure of the house was designed so that interior partitions are all non-loadbearing, so the inside of the house could potentially be changed easily. The simple form of the home also would allow it to be expanded in multiple ways, while maintaining the existing home's roof lines and circulation flow.



The design team examined how the existing home design could be adapted to be ADA accessibility standards if required, with the master bedroom serving as the accessible bedroom. Only a few minor changes to the house would be required to accommodate ADA accessibility. Further, the separation of the bedrooms (part of the 'separate but connected' concept) would allow the home to be occupied by a homeowner who may require assistance from a live-in caregiver, who could sleep in the opposite bedrooms.



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Passive design features including insulation, thermal mass, and passive heating and cooling provide resilience through 'passive survivability,' giving the home the capability to maintain comfort for a much longer period than a conventional house. During times when utilities are interrupted, this can keep the house from quickly gaining or losing heat, and threatening the health of occupants. Construction during the winter showed that the house could remain comfortable in sub-freezing temperatures using just 1300W of heat from a utility heater.

The structure of the house was designed using International Residential Codes (IRC) requirements for structural design, including prescriptive bracing. Wood framing in many areas, including rafters and beams, were engineered or mechanically stressed rated. We also used engineered metal structural connectors throughout the building to resist both gravity and lateral loads and ensure the proper connection between framing members, usually exceeding loads and required values with additional capacity.

The COVID pandemic also greatly influenced how the team thought of the home's design, with respect to resilience. The 'social core' and 'separate but connected' concepts in the house could be very useful in a work-at-home situation, for many reasons. The separation and size of the master bedroom would make it useful as a home office. Despite the small footprint of the house, the open living space provides enough distinct spaces for household members to spread out and occupy the living room, dining area, and kitchen areas for work or learning.

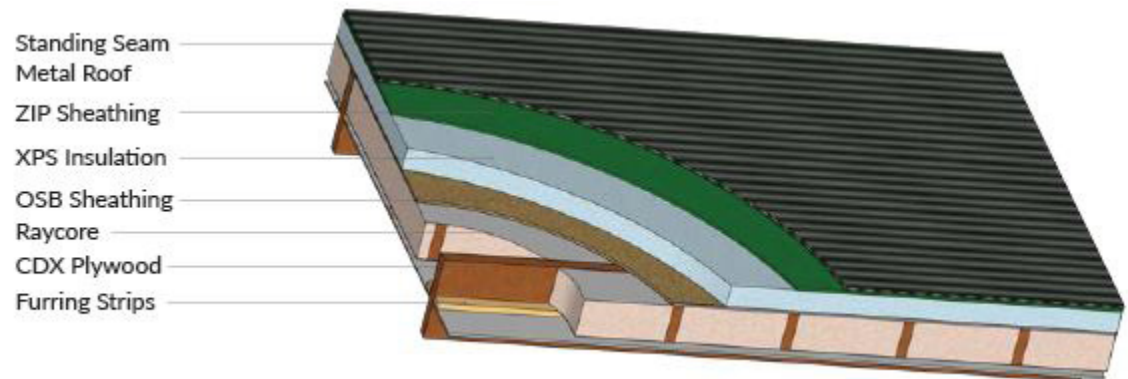


The figure above shows the 'social core' concept used in the home.

Affordability is also closely related to resilience. A home that has an already low cost of ownership and operation helps to ensure that the homeowners have the resources to maintain the home over time. The smaller size of the home and its energy-conscious systems also have lower replacement costs than comparable conventional homes with large heating and cooling systems, water tanks, and redundant bathrooms.

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Lastly, many parts of the home's construction and finish systems were selected for long-term durability and resilience to deterioration, including the ZIP weather barrier system, closed-cell foam insulation systems, the elevated slab foundation, high quality vinyl windows, and metal siding and roofing systems. All exterior finishes are either metal sheet cladding with factory-applied and warranted paint, or wood. These materials can resist weather extremes well for our climate and can be serviced or replaced readily and inexpensively.



The figure above breaks down the roof panel components, showing the studios choices of durable and resilient materials.